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FINANCING WASTEWATER SERVICES IN DEVELOPING COUNTRIES

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Guidelines for Cost Management in Water and Sanitation Institutions. WASH Technical Report 54. June 1990. Prepared by Ronald W. Johnson.

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ACRONYMS

BOT	"build, operate, and transfer"
GDP	gross domestic product
MOC	Ministry of Construction
MOE	Ministry of Environment
MOHA	Ministry of Home Affairs
NWIP	National Water Improvement Program
NWTP	National Wastewater Treatment Program
OECD	Organization for Economic Cooperation and Development
O&M	operations and maintenance
PSP	private sector participation
SRF	state revolving fund
STP	sewage treatment plant
WHO	World Health Organization
WS&S	water supply and sanitation

EXECUTIVE SUMMARY

In recent decades, central governments in many developing countries have found it easy to obtain financial and technical assistance for water system construction. Rising urban demand for clean and safe water, combined with health and environmental concerns, have spurred donor agencies to fund water projects, usually based on U.S. models. However, two important aspects of expanded water services have received less attention: treatment and disposal of the higher quantities of wastewater that result and financing mechanisms for both operations and maintenance and capital investment in the wastewater sector.

This report provides information about current wastewater financing practices in both industrialized and developing countries. Although more comprehensive data is available from models in the United States, the Korean and French cases provide a broader basis for comparing policy and regulatory climates, detecting trends in decentralization, and evaluating the feasibility of sectoral financial autonomy.

These case studies provide three quite different approaches to the sector. The United States is a completely decentralized model in which the central government's role has been confined to financing and broad regulation of the sector. Furthermore, the last 20 years have seen wide swings in the level of central government subsidy to the sector, as well as some recent innovations such as revolving funds at the state level to leverage grant funds through borrowing in the private capital markets.

France provides a case example that combines the European River Basin Authority model with municipal ownership of water supply and sanitation systems and heavy reliance on private firms to manage the systems under long-term contracts. Korea provides an example of a country that is decentralizing authority for the wastewater sector and also greatly increasing overall capital investment, while shifting the burden of cost recovery to users.

These case studies support several contentions:

- It is unlikely that user tariffs can finance all wastewater costs, even in industrialized countries.
- Long-term subsidization of infrastructure financing for the wastewater sector leads to less efficient use of resources and displacement of private and local sources of capital.
- Demonstrating the linkage between water usage and sewage disposal (and pollution control costs) tends to increase sector revenues, promote water conservation, and improve public management of resources.
- Beneficiary charges, pollution control legislation, and environmental education are effective ways to influence consumer attitudes concerning the real costs of wastewater collection and treatment.

Wastewater finance cannot be treated in isolation from water supply, nor can it be separated from the larger issue of municipal infrastructure finance, given that local governments will play an increasingly important role in both cost recovery and assumption of the growing debt burden.

A trend toward decentralizing responsibility for financing at least a portion of sanitation capital investment is evident in both industrialized and developing countries. Some privatization of service delivery is also occurring as a way to increase efficiency through better management and use of resources. Ultimately, developing countries will need to evaluate past and current practices in the water and sanitation sectors in order to develop efficient and equitable strategies for serving expanding populations with fewer resources.

1

BACKGROUND AND ISSUES

1.1 Introduction

This paper was developed for host country officials and donor agency staff involved in setting national policy and designing financing mechanisms for wastewater programs.

In exploring ways that expanded wastewater coverage can be financed in developing countries, the paper examines key issues that affect cost recovery and financing of wastewater systems in both industrialized and developing worlds. The paper discusses financing options relative to three key objectives:

- Resource mobilization
- Economic efficiency
- Equity.

Case studies from the United States, France, and Korea present three different approaches to wastewater finance and discuss how these different approaches treat the three objectives above. The final chapter of this paper presents lessons learned from past and present experience, which should guide the development of wastewater financing strategies. However, this paper intends not to provide a blueprint for sector finance but rather to present the alternatives and considerations that bear upon the selection of financing choices.

1.2 Background

During the 1980s, the U.N. International Drinking Water and Sanitation Decade focused attention and resources on the water supply and sanitation (WS&S) sector in developing countries. The eighties (and early-nineties), however, have been a difficult period for public investment in developing countries, with the sharp drop in foreign lending and slow economic growth at home. Yet, while overall public investment declined as a percentage of the gross domestic product (GDP) over the decade (from 10.9 percent to 8.7 percent), WS&S investments held steady at about 0.4 percent of GDP across developing nations. This investment has been directed principally at water supply, for which there has been a high demand and a growing user willingness to pay. In 1990, water supply was estimated at 68 percent and 42 percent for urban and rural populations respectively. Sanitation figures, however, paint a different picture: current estimates place these at only 38 percent (urban) and 15 percent (rural).

The World Health Organization (WHO) and the World Bank estimate that, during the latter part of the 1980s, approximately US$9 billion per year was invested in water supply and sanitation in developing countries; about one-third of this came from international donor organizations, mainly in the form of loans (World Bank 1988). This level of investment represented a substantial increase over past levels and led to extended coverage. However, given their rapid population growth, especially in urban areas, developing countries would have to maintain this level of investment just to preserve current coverage levels. To continue coverage expansion will require even greater amounts, as shown in the boxed material relating to Latin America and the Caribbean.

Box 1

WS&S Service Targets for Latin America and the Caribbean

The World Bank estimated in 1988 that nations of the region would have to extend coverage to another 234 million people for water supply and another 288 million for sewerage by the year 2000 to provide complete coverage. The cost of this expansion is approximately $92 billion (in 1985 dollars); even a more modest target of 84 percent coverage for water supply and sanitation would cost $78 billion.

Because the region is already highly urbanized and urban population growth rates are high, about 95 percent of this investment would occur in urban areas. While water supply projects have dominated past investments, sewer systems and waste treatment are expected to predominate in the years ahead. To close the gap between water supply coverage and wastewater system coverage, about 56 percent of future investments should be for wastewater collection and treatment.

In addition to system expansion, a substantial amount of investment must address rehabilitation in order to bring existing systems up to standard. Approximately 15 percent of the total sector investment is expected to be devoted to rehabilitation.

Source: *World Bank, Latin America and The Caribbean Region Water Supply and Sewerage Sector: Proposed Strategy*, 1988.

The existing pattern of WS&S investment is likely to maintain, if not exacerbate, this gap between water supply and wastewater coverage. While piped water systems are being installed at a high rate, communities continue to rely on ad hoc arrangements of sewage disposal technologies that mainly consist of on-site treatment (cisterns and septic tanks) and the use of surface drainage to remove wastewater. (Indeed, this same pattern characterized urban areas of the United States at the turn of the century.) However, with rapidly increasing piped water supply, such wastewater arrangements are quickly overwhelmed as households increase their water consumption. This gap between piped water supply and wastewater removal virtually guarantees that massive investments will be required to retrofit areas now benefiting from piped water investments, especially in urban areas.

Even when lower cost technologies are adopted, adequate wastewater collection and treatment is expensive and capital intensive. While system costs can vary widely depending on local cost factors, overall it is estimated to cost about one and one-half times more to collect and adequately treat a cubic meter of wastewater than to supply a cubic meter of potable piped water (Bartone 1991). This is a daunting ratio, especially given that recent water supply projects in developing countries have been unsuccessful in recovering their costs from user fees. A recent World Bank study of Bank-financed water supply projects implemented from 1965-1980 found that only 11 percent had met their financial targets of recovering all operating and capital costs from user fees (Garn 1990). Studies from individual countries similarly show just how difficult it is to put water supply on a self-financing basis (World Bank 1988; Pereira et al. 1992).

If water supply, for which there is a high demand and substantial willingness to pay, cannot be made self-financing, what chance have wastewater systems, which are even more expensive, to become financially viable?

Clearly, wastewater financing requires strategies that go beyond exclusive reliance on direct user charges. Indeed, almost every country (including some that are industrialized) derives wastewater financing from additional sources, both local and national. However, it is not simply an issue of having to mobilize additional resources. It also becomes an issue of how to raise those resources in ways that are both economically efficient and equitable.

The interaction between sector finance and economic efficiency is key to the process, as financing mechanisms serve as powerful incentives to use WS&S sector resources in either efficient or wasteful ways. Also significant are regulation and pricing policies devised to promote efficiency: these have tremendous impacts on demand for WS&S services and on opportunities for cost recovery and resource mobilization. Unfortunately, these issues have often been approached from either a finance position or an economic efficiency perspective, with the two rarely combined. A major objective of this paper is to integrate these objectives.

1.3 Main Issues in Wastewater Finance

Who Pays for Wastewater Services

Financing mechanisms must meet multiple objectives, including revenue generation, economic efficiency, and equity. In general, these three objectives are best met by charging the polluter (whether an individual household, an industry, or a municipality) the cost of mitigating the pollution—the so-called polluter pays principle. Such a principle should result in a level of charges that encourages the polluter to minimize the waste stream and/or provides sufficient revenue to treat the waste. However, the charges set must take into account both willingness and ability to pay. Furthermore, in almost no cases in either the industrialized or developing world have direct user charges actually been high enough to cover all capital and operating costs of wastewater systems. Most countries find ways to provide subsidies from the national and local government budgets.

Wastewater Service as a Public vs. Private Good

In deciding who pays for wastewater treatment, it is useful to apply the concept of "public and private goods." In the context of public services, private goods are those services whose benefits accrue mainly to individuals and not to the public at large. Public goods, on the other hand, provide benefits to the public at large; such a good would be national defense, for example. Many public services combine elements of both private and public goods: vaccination provides benefits both to the individual receiving the vaccine and to the general public by lowering the risk of disease transmission. Piped water supply is coming to be viewed as largely a private good, with the cost borne by the individual users. Wastewater collection and treatment, on the other hand, has components of both public and private good. Indeed, many argue that it is the downstream water users who benefit from wastewater treatment, not those discharging the waste. Furthermore, national governments have changed the "rules of the game" by tightening water quality standards and progressively limiting what is allowable in terms of wastewater discharges. For these reasons, most countries recognize that wastewater treatment provides a substantial public good, and national budget funds subsidize at least a part of local wastewater treatment.

Wastewater Service Organizations

Specific financing systems for wastewater collection and treatment depend to a large extent on how responsibility for service provision is divided among the various institutions in the sector. In the United States, Canada, and Western Europe, wastewater management is usually the responsibility of agencies that also provide piped drinking water. These agencies may be municipalities, county governments, or separate special-purpose authorities. It is logical to combine piped water and wastewater within the same agency for two reasons:

- The availability of piped water determines the level of wastewater generated.
- User charges for wastewater are generally tied to piped water consumption, at least for those users that discharge into publicly provided sewage systems.

In several European countries, environmental planning and control of the WS&S sector rests with river basin authorities, which impose regulations and water quality standards and collect effluent fees from wastewater discharges in the basin. While WS&S services are still delivered at the local level, this arrangement provides an intermediate level of regulation and financial management for the sector.

An important consideration is whether the WS&S agency has broader taxing authority, as does a municipal or county government. If not, the agency must rely on user fees, special assessments, or transfers from governmental bodies to cover costs. This has particular relevance for borrowing for capital investment, since user fees alone are generally insufficient to repay capital costs even in the industrialized countries.

Cost of Wastewater Services

The technology developed in the West for wastewater collection and treatment is capital intensive. In general, total costs of providing wastewater collection through sewer networks are about the same as providing treated drinking water. The cost of treating the effluent from these systems varies with the level of treatment, but generally runs about 50 percent of the collection costs on a per unit basis (per cubic meter of water treated). This means that adding wastewater collection and treatment to a piped water supply system would add about 150 percent in costs per cubic meter of water provided and disposed of.

In 1988, the World Bank sector study for the Latin American and Caribbean region estimated that per capita costs for sewerage investments ranged from $200 (Argentina) to $120 (Haiti) for conventional piped systems (in 1985 dollars). Worldwide, WHO uses an estimate of $150 per person for urban areas in constant 1985 dollars. But local construction costs, economies of scale, and costs of different wastewater treatment technologies can vary tremendously from place to place. For example, in several Eastern European countries, high standards of sewer construction combine with inefficient practices to make capital costs of new sewer system construction virtually unaffordable, at a cost of between $1,500 and $3,000 per household served (WASH 1993).

Demand for Wastewater Services

A major problem with cost recovery in wastewater services is the general lack of demand for those services in developing countries. As a result, users are reluctant to pay for such services, and local officials have little interest in channeling public investments to the sector. Generally, therefore, demand for sanitation services remains low until some crisis arises—either epidemic outbreaks or unacceptable local environmental conditions.

Users often differentiate between waste collection and waste treatment, with waste collection seen as directly benefiting the system users. Treatment of the waste stream, however, tends to be seen as benefiting downstream users and is often treated as a wider public good. This distinction has found its way into most financing schemes, with collection systems paid for by a combination of user fees and local taxes and treatment facilities often highly subsidized by national transfers.

Given the low level of demand for wastewater services, especially treatment, government regulation becomes an important factor in fostering that demand. Indeed, most studies of current schemes to promote demand for wastewater services have found that regulation (imposing standards on wastewater discharges by both industry and local government) has been critical in fostering compliance. Enforceable regulation has been found to be key in allowing economic incentives to work (OECD 1989.)

Equitable Access to Sanitation Services

As WS&S services are increasingly placed on a cost recovery basis, it becomes harder and harder to serve the poor. Most WS&S agencies in developing countries now have tariff policies that contain some degree of cross-subsidization for water supply based on amount used: i.e., consumption is charged at an increasing block rate. Insofar as sewerage charges are based on water tariffs, they also should reflect a similar cross-subsidy. The tougher problem lies in recovering capital costs that, for a conventional sewer system, are proportionally higher than for water supply. Equity considerations indicate that system beneficiaries should pay the cost, yet equity also suggests that payment be based on ability to pay. As it is difficult to negotiate capital cost recovery from homeowners on a parcel by parcel basis, strategies using some surrogate for wealth (such as property value) may be appropriate. In addition, for target areas where all households are poor, a lower proportion of capital cost recovery may be negotiated for the entire area. There are also innovative schemes for serving lower income households by using neighborhood associations to organize community construction of sewer systems (for example, the Orangi Project in Pakistan). In such schemes, the lower income residents contribute labor rather than cash.

Relation to Overall Infrastructure Finance

The financing of WS&S sector investments falls within the larger framework of local infrastructure financing in developing countries. In many of these countries, central government is shifting a greater burden of infrastructure finance onto local governments, which leads to a concomitant increase in cost recovery from services beneficiaries. Central to this strategy is increased reliance on loans to local authorities rather than grants for capital investment.

WS&S sector investments are a key element of local infrastructure investments. In Indonesia, for example, over the last decade about half of all loans to subnational government (including local public enterprise) have gone to WS&S projects, mainly urban water supply (Iskandar 1992). Much of the WS&S sector investment has been through subsidized loans, many of which originated with external lending agencies. However, there is now a movement away from subsidized loan programs, as such programs are seen as undercutting the growth of sustainable financial institutions within developing countries (World Bank 1989). Furthermore, the experience with infrastructure loan programs in developing countries has not been good, in general, mainly because of poor repayment.

In sum, the increased reliance on debt financing of the WS&S sector is being undermined by two types of institutional failure. On one level, local WS&S agencies that borrow the funds are failing to meet their cost recovery targets and therefore are at risk of default. On the second level, national lending programs are not effectively securing repayment from local authorities,

so that loan programs are in effect being converted into grant programs. In the future, lending to the WS&S sector will likely become much more selective and emphasize demonstrated credit worthiness of individual borrowers. It is also likely that directed and subsidized credit schemes will become fewer, which would force more and more WS&S borrowing into the private capital markets of developing countries.

2

WASTEWATER FINANCING MECHANISMS

Because of the high costs of conventional wastewater collection and treatment, agencies usually adopt a mix of cost recovery and financing strategies. The main elements of cost recovery may be grouped under three main categories: direct cost recovery from the user/polluter (also known as "beneficiary charges"), indirect local taxation (typically using the property tax as a vehicle), and subsidies from higher levels of government.

2.1 Direct Beneficiary Charges

Direct beneficiary charges are aimed at recovering wastewater service costs from those who benefit from the service. In the case of wastewater collection and treatment, the beneficiaries are broadly defined as those creating wastewater, whether or not they use public wastewater systems directly.

Direct user charges for water supply and wastewater management are promoted both as a measure to raise revenue and as a means to induce efficiency in usage. For example, the combined water and sewer rates in Miskolc, Hungary, have risen from about $0.03 per cubic meter in 1989 to about $0.75 in 1993. Water consumption has dropped about 20 percent with a concomitant drop in the demand on the wastewater treatment plant.

Consumption-based User Charges

Consumption-based user charges are fees levied upon the wastewater discharger, based typically on volume and (for industry and commercial establishments) possibly on characteristics of the effluent. Since wastewater volume is closely tied to the consumption of piped water, wastewater charges are usually computed as a surcharge on the water tariff. User charges typically aim to cover the O&M of the wastewater system as well as depreciation of the capital costs not otherwise financed by connection fees and subsidies.

Service Connection and Availability Charges

Connection and availability charges are a type of user fee but differ in the manner in which they are assessed. Connection fees are charged to the user for the costs of hooking up to the system; at a minimum, these include the cost of the sewer line from the household or business establishment to the secondary line. Connection charges may also include the costs of secondary collection systems—in some cases, these are called "availability fees"—or special levies for having the sewer system extended into an area. Such fees may be computed as a

per lot charge, on a road frontage basis, or on a per unit of area basis; in some cases, these fees may be computed (and collected) as a surcharge on the property tax.

If connection and/or availability fees are too high, households may decide against hooking up to the system. One solution would be to allow households to amortize the cost over several years, or to lower the fee by shifting part of the capital cost to the rate base of the consumption charge. The latter measure raises the charge per cubic meter of water consumed while lowering the cost of connecting to the system. This tradeoff between consumption charge and connection fee can be manipulated by the water agency to affect both service coverage (amount of users connected to the service) and service usage. In low income areas, connection fees may be eliminated entirely, or community groups may be given responsibility for providing connections through community labor.

Effluent Fees

Effluent fees are charged to a discharger of wastewater into the environment (whether into a public sewer system or into surface waters). Such charges can be imposed to force polluters to reduce waste discharges or to generate revenue for public cleanup programs. Effluent charging schemes can become quite sophisticated, with fee structures that vary according to differing objectives: preserving a certain level of water quality in the receiving waters, raising enough revenue to finance pollution abatement, and mandating a certain level of effluent standards (Bernstein 1991).

Effluent fees are most widely used in Europe, where they are typically developed on a river basin or watershed management basis. There are two main distinctions between effluent fees and direct user charges: user charges are designed to recover a specific level of costs incurred by the wastewater system and are divided among the system users on the basis of usage; effluent fees are determined on the basis of damage to the environment and may be adjusted to promote changes in polluting behavior. In Europe, effluent fees are typically collected by river basin authorities and are either transferred to local wastewater systems or, in some cases, rebated to polluters who provide their own waste treatment. In some European countries, these fees are used to capitalize special "environmental funds" that make grants and loans to localities for pollution abatement projects.

Discharge Permits

Closely related to the effluent fee is the discharge permit, which may or may not be tradable (i.e., can be traded or sold to another waste discharger). Discharge permits, which are either sold or allocated to industries, fix the amount of pollutants that can be discharged into the environment. In theory, this allows the government to determine the pollution level that will be tolerated overall and also to determine the level of pollution abatement that will be needed. Tradable permits allow market forces to affect the prices of these permits. Many economists favor tradable discharge permits because they allow market forces some influence within the realm of pollution control. They also raise certain equity and political issues over who has the

right to pollute and how the permits are allocated in the first place. Indeed, ownership of discharge permits could provide windfall profits for some, if the original price were set too low.

2.2 Indirect Local Taxes

Local governments have long used their taxing authority to support wastewater collection investments. This support involves taxation to generate revenues directly for wastewater system financing and also the use of taxing authority to guarantee loans for system investments.

Property-based Taxes

Local authorities may recover sewerage investments through surcharges on the property tax. In general, these are levied only on properties with access to the sewer system, in which case surcharges are actually a variant of a user charge. However, such charges are based not on volume of usage but on property valuation. Thus, instead of being tied to the cost of providing the service, they relate to a measure of wealth; some would argue that, because they are linked to ability to pay, such levies are more equitable. Property-based taxes such as these have a major limitation, however: they depend upon the performance of the property tax system. In most developing countries, local property taxes are not well managed and the tax rates are not buoyant (i.e., rise in line with economic activity or inflation). This means that yields from such surcharges typically do not keep up with costs.

Other local taxes in developing countries are rarely used as vehicles for infrastructure cost recovery. In industrialized countries, the use of indirect taxation vehicles is yielding to greater reliance on direct charges such as effluent and user fees.

Local Tax Guarantees

The use of local tax guarantees is confined largely to the United States, where local authorities may use their local taxing authority to guarantee repayment of bonds issued to pay for sewerage investments. In general, such bonds are backed by the revenue stream of the issuing authority (so called "revenue bonds," as differentiated from "general obligation" bonds backed by the locality's general tax revenues). In a number of cases, local authorities may also pledge general local taxes, should the specific project revenues fall short. These doubly backed bonds are called "double-barrel" bonds and result in lower interest rates. For sewerage and waste treatment schemes, such bonds are appealing since total cost recovery through user fees may be difficult. Because these double-barrel bonds are hybrids of revenue and general obligation bonds, they also require local taxpayer approval before being issued.

Shared Tax or Grant Fund Guarantees

A variation on the local tax guarantee is the earmarking of tax or grant funds from higher levels of government to pay for investment loans or bond issues. Although not yet widespread, this practice has occurred in several developing countries to cover the risks of local

infrastructure loans. The most widespread use has been in Jordan, where the Cities and Villages Development Bank (CVDB) takes loan repayment directly from the block-grant funds allocated by formula to all local governments. (Because the CVDB handles grant-fund transfers as well as loans to local governments, such an arrangement is administratively and legally straightforward.) Most developing countries provide substantial transfers to local governments (both in direct grants and shared taxes); thus, the use of these funds to guarantee local loans is appealing. Such guarantees could be designed to encumber the general grant funds or only specific revenues sources. The most-secure type of guarantee would involve a revenue source that is buoyant, with a formula-driven distribution codified in law. For example, shared taxes based on a solid source (e.g., motor fuel or VAT) would be more secure than would ad hoc grant funds.

2.3 Subsidies

Subsidies fall into 3 major groupings:

- Direct local grants to cover the cost of new capital investment in collection and/or treatment facilities
- Subsidized loans
- Tax allocations.

Direct grants and subsidized loans are directed largely at local governments and authorities to enable them to provide essential public services. In some cases, such subsidies may also be directed to private industry to enable companies to comply with new pollution regulations cleanup. Tax allocations are also aimed at industry to support pollution abatement investments.

Direct Grants

Direct grants are frequently used in wastewater collection and treatment, given the high level of capital costs and the perception that wastewater treatment is partly a public good. In the United States, parts of community collection systems have been paid for by local general revenues since the late 1800s. Following the adoption of the Clean Water Act in 1972, U.S. government construction grants provided up to three-quarters of the cost of secondary-stage wastewater treatment plants. After peaking in 1977 at a little over $4 billion, the level of federal subsidy has declined steadily since the eligibility requirements changed in 1981. From 1973 to 1987, direct federal construction grants in the United States accounted for about $40 billion of the approximately $80 billion invested in sewer systems across the country (see the U.S. case study in Chapter 3.) In other Organization for Economic Cooperation and Development (OECD) countries, central government subsidies are widely used, with the exception of the United Kingdom and Australia (OECD 1989).

Typically, direct grants have been aimed at capital costs and usually earmarked for specific types of facility construction (e.g., advanced secondary wastewater treatment.) Such earmarked subsidies have two major problems. First, they seldom provide local authorities with incentives to reduce demand for pollution abatement or to improve the efficiency of existing operations. Second, they typically subsidize on a percentage basis, meaning that wealthy areas often benefit to a much higher degree than do poorer regions. By covering a high percentage of wastewater treatment construction costs, such subsidies have helped bring about the improvement of surface water quality in the West. However, when central government support for such investments is reduced, as has occurred in the United States in recent years, localities generally must raise fees and taxes sharply in order to expand and replace such facilities.

Subsidized Loans

Most often, subsidized loans fall into three categories: direct loans from the central government, loans from a special-purpose agency capitalized with central government grants, and loans that are subsidized indirectly by tax exemptions on interest paid.

Direct loans may be provided by an agent of the central government at either a fixed or floating rate. Such loans may be earmarked for a particular type of facility (e.g., waste treatment plant) or for general infrastructure construction. The subsidized loans are provided at below-market rates within the county and may or may not be above "positive real rates" (i.e., greater than the inflation rate within the country).

In developing countries, many such infrastructure loans are financed by international lending institutions that can provide the loans to borrower countries on a subsidized or nonsubsidized basis. Even the nonsubsidized loans are provided at very good rates since the lending agencies, such as the World Bank, obtain their funds in the international capital market at favorable rates. These loans are denominated in an internationally traded currency such as dollars, yen, or marks. Since the borrower government often lends these funds to local authorities, to be repaid in local currency, repayment entails exchange rate risk for the borrower. In the past, central governments have typically assumed the exchange rate risk and, in fact, have not been much concerned about the true cost of their borrowing on an exchange-weighted basis. This is changing as it becomes clear that exchange rate risks add a substantial premium to the borrower's true "cost of money."

Much of the lending for WS&S infrastructure in both industrialized and developing countries is carried out by special-purpose institutions. In Western Europe, these institutions take the form of municipal banks that raise funds in the private capital markets and lend to localities, generally at unsubsidized rates. In developing countries, many such institutions have also been created, usually providing credit at subsidized rates.

In the United States, such institutions have only recently been created at the state level specifically for the financing of wastewater facilities. These new institutions, capitalized by both central and state government grants, are known as state revolving funds (SRFs) because the capital remains in the fund indefinitely rather than being repaid to the central and state

governments. Such SRFs may either lend their capital directly or "leverage" that capital by borrowing additional funds in the private capital markets through bond issues. For example, the New York State Revolving Fund has been able to leverage its initial capital grants of about US$1 billion into about US$3 billion in loans for local sewerage and waste treatment projects. The SRFs typically provide below market rate loans to localities; some SRFs may even provide loans at zero interest for poorer areas.

While the United States has developed the SRF approach to aid the financing of wastewater systems, U.S. localities typically borrow in the private capital markets, via long-term bond issues, to finance most infrastructure projects. However, these "borrowings" are subsidized by the central government through federal tax exemptions on the interest paid; these exemptions enable localities to issue bonds at below-market interest rates.

These "indirectly" subsidized loans are the primary means by which the U.S. federal government extends financial support to local governments. By indirectly subsidizing local public investment through the tax system, however, the central government loses a certain amount of control over how those funds are used. Furthermore, local governments are surprisingly clever about exploiting this tax subsidy to achieve results never intended by the central government. For example, in the United States, many local governments used tax exempt bonds to finance construction of private commercial development in their locales—a practice that was ended by reform of the national tax code in 1986.

Tax Allocations

Used primarily to subsidize private sector investment in pollution abatement, tax allocation typically provides deductions against taxable income for some portion of the investment. Such subsidies are justified on the grounds that they are mitigating a hardship imposed by the government by changing regulation of environmental standards (i.e., causing a previously acceptable practice of polluting to become unacceptable) and usually provided on a temporary basis to allow the industry to adjust to the new standards.

It is also argued that, if industry does not invest in pollution abatement, the job falls on the government. Thus, tax allocation is cost effective and economically efficient approach in many circumstances. Of course, there are both equity and political implications: some firms will receive more subsidy than others, and the public is paying industry (via the subsidy or tax break) not to pollute. On the other hand, tax allocations are appealing to politicians because they need not appropriate budgetary funds to cover these subsidies; in this sense, such subsidies are often called "hidden" or "off-budget." Nevertheless, they represent a true expenditure by the government.

Another key issue of central government subsidization is the extent to which the subsidy is open-ended or limited. Open-ended obligations include:

- Grant programs that pay a percentage of eligible costs (e.g., 75 percent of all treatment plant construction costs)

- Indirect loan subsidies through tax exemptions (such as those granted on interest from U.S. municipal bonds)
- Tax allocations to industry

Although all of these have some theoretical upper limit, the actual impact on the central government budget in a given year may be hard to predict. As previously noted, local governments are fairly creative in finding ways to extend the application of such open-ended subsidy programs.

One of the thorniest problems of public subsidies for local infrastructure, including wastewater systems, is that of targeting the subsidy to the proper beneficiaries. In general, most subsidy schemes are justified on the basis that the service would otherwise be unaffordable to part of the target population. However, most central to local subsidies apply to capital construction of facilities and are not closely targeted to the groups who cannot afford to pay (i.e., the poor). Indeed, subsidies for capital construction generally accrue to those who use the service most—upper income groups, in most cases.

This imbalance can be countered by a combination of two strategies: providing for internal cross-subsidization of the service user fees so that the poor pay proportionally less than upper income users and guaranteeing low income users access to the public services. In developing countries, however, implementing these two strategies for water and wastewater services presents several problems. First, water supply and sanitation services are being placed increasingly on a self-financing basis, in many cases operated as autonomous local authorities. Such a structure provides few incentives to extend services to low income users who probably cannot afford connection fees and may be unwilling or unable to meet monthly user fees. Moreover, it is difficult to build conditionality into subsidy programs so that coverage targets for poor residents can actually be enforced. Indeed, the most that is usually attempted is a progressive tariff structure that charges low users less on a per unit cost.

2.4 Private Sector Participation

Accompanying the WS&S sector's shift to an increasingly self-financing mandate has been a growing interest in private sector participation. This interest is stimulated by two main factors: the private sector's ability to efficiently manage a service based on user fees, and the additional capital investment that this sector can mobilize through access to both private equity and debt financing.

It should be emphasized that while there is great interest at present, actual experience with private sector participation (PSP) in the sector is quite limited, especially in developing countries. For the WS&S sector PSP can be grouped under five main types:

- Direct investment (equity ownership) in WS&S service systems, either the entire system or parts of the system

- Limited term investment in WS&S service systems through "build, operate, and transfer" (BOT) schemes
- Management contracts, or concessions, to operate WS&S systems under a limited term arrangement
- Equipment ownership and leasing arrangements
- Private sector contracting, such as bill collections, for various activities of WS&S service agencies.

These aspects are discussed more fully in WASH Technical Report No. 56, *Alternatives for Capital Financing of Water Supply and Sanitation* and in WASH Field Report No. 330, entitled *Private Sector Participation in Urban Water Supplies: Issues for Investment in Indonesia.*

Major experience with private sector participation in developing countries has been largely limited to Côte d'Ivoire (private management of WS&S services under concession arrangements) and Malaysia (BOT and concession contracting). Efforts are now underway to expand private sector participation in Indonesia, with USAID help, and to privatize the WS&S authority in Buenos Aires, Argentina.

In Indonesia, the central government has adopted a national policy to promote private sector participation, and some experience is currently being gained by pushing ahead with selected BOT projects for which there is a high probability of success (enclave developments serving industry or tourist hotels and water supply source works). However, much remains to be done there to solidify the regulatory environment, develop mechanisms whereby local water authorities can enter into joint ventures and enforceable contractual arrangements with the private sector, and develop financing arrangements to support private investment (both domestic and off shore).

In Buenos Aires, the WS&S authority is attempting to privatize its water and sewer authority through a concession contract issued to a private firm to operate the system on a 30-year term. The contract will be awarded through a competitive bidding process, with the winner determined largely on the basis of low-cost proposals for average tariffs, with mandated coverage targets in specific areas of the city. The contractor will be responsible for all operations and maintenance and new capital investment to meet the coverage targets. While the procedure for estimating water supply tariffs appears to be fairly straightforward, potential bidders have expressed concern that capital costs of the sewer system may require subsidization from a higher level of government. This aspect will likely be part of the contract negotiation, and it is unclear at this time how that will be resolved.

PSP schemes, especially those involving privatization of existing municipal systems, often encounter political opposition from labor groups. The Buenos Aires WS&S privatization scheme includes provisions for protecting a certain percentage of existing jobs in the WS&S authority over the first several years of the scheme. In developing countries, job preservation in the face of privatization is a key issue since evidence suggests that WS&S agencies tend to

have high operating costs driven largely by excessive staffing. Indeed, the cost to deliver a cubic meter of potable water in developing country municipalities is not much different from the cost in the United States, with O&M costs (dominated by labor) accounting for a much larger proportion in the developing country agencies—even with much lower per labor costs per person. Indeed, PSP schemes are appealing insofar as they will provide management efficiency and bring down labor costs significantly.

Another reason for advocating PSP lies in the additional capital thus attracted to the sector. It should be noted, however, that there is already a great deal of private capital invested in the WS&S sector in developing countries, both through residential water supply and through on-site waste treatment facilities. For example, much of sewage collection in the developing world takes place via the informal sector and, therefore, is often not counted in official investment accounting. As formal sector solutions replace informal sector approaches (e.g., piped sewer networks replace cistern cleaning and haulage), private sector involvement and investment actually decline.

It should also be noted that, in many developing countries, private capital is generally more expensive than publicly provided capital; inefficiencies in the financial/banking system result in very high real rates of interest. In these instances, to lure private capital into WS&S sector investments requires very high rates of return on those investments, an unlikely event in all but a very few cases. Most of the private capital attracted to the WS&S sector in developing countries will likely come in one of three ways:

- Capital provided as part of concession type contracts such as those in Buenos Aires and Côte d'Ivoire
- Capital provided as part of BOT schemes
- Debt provided through local authority bond issues (which are secured in some fashion by central government guarantees or solid revenue/tax streams)

It should be emphasized that none of the three approaches above has as yet been widely used in developing countries. However, if private sector participation progresses as hoped, then all of these approaches will be further developed and applied.

3

WASTEWATER MANAGEMENT CASE STUDIES

3.1 Introduction

Three case studies are presented in this section: United States, France, and Korea. The United States and French cases provide examples of industrialized country approaches that differ considerably. France relies on a highly developed system of effluent charges managed by a set of river basin authorities. These effluent charges supplement local user charges as well as national subsidies for facility construction. In addition, France relies extensively on private sector management of local water and sewer systems.

The United States has historically financed wastewater capital costs through local government revenues, with operating costs recovered from direct user charges. U.S. local governments raise investment funds through bonds issued in the private capital market, with some subsidization through favorable tax treatment. In the 1970s, the federal government instituted a program of construction grants for wastewater treatment plants that has provided about half of all wastewater investment in the United States over the past 15 years.

Korea provides a case study of a developing nation that is undertaking a major restructuring of its WS&S financing. The country has reached a point at which greatly expanded water supply coverage over the past decade is creating a demand for wastewater services. A cornerstone of the Korean approach is increased water tariffs for system users.

All three case studies include descriptive information on sector institutions, environmental regulations, and governmental policies relating to wastewater service delivery and to financing of infrastructure and O&M. Currently, however, there is a scarcity of published data on wastewater financing in both industrialized and developing countries, with the exception of the United States; as a result, the paper draws heavily from U.S. experience in both this section and the concluding ones.

3.2 Financing Wastewater Systems in the United States

In the United States, current methods of managing sewage and wastewater in urban areas have gradually evolved over the past 200 years in response to the demands made by businesses, civic associations, and citizens on the resources of their local governments. The decisions of individual municipalities have also been influenced by political, economic, and health factors that have increased the tension between adequate service and lowered costs. Responsibility for the collection and treatment of sewage has vacillated between the public and private sectors, as local governments have struggled through the years to meet rising demand from population growth, technological advances, and pollution control.

The financial circumstances surrounding water supply and wastewater disposal systems operated by U.S. local governments are also often in a state of flux. This case study examines some of the more important aspects of these changes. In addition to general revenue and spending patterns, the study pays special attention to the trends in indicators of financial self-sufficiency.

3.2.1 Background

In the late 1700s, municipalities considered commercial promotion to be their most important activity. As a result, infrastructure development was limited to the construction of docks, the digging of town wells, and the paving and lighting of main thoroughfares. Residents assumed responsibility for procuring most other services or, in some cities, delegated them to volunteer groups. Cesspools or privy vaults located close to residences or even in house cellars collected human waste and wastewater and were covered over when full. By the 1830s, most large cities were attempting to regulate vault emptying through a combination of private contractual arrangements to meet demand and the use of city employees to lower costs, with less than satisfactory results.

By the middle of the nineteenth century, larger urban governments had taken on more responsibility for certain services, including public health and sanitation, although facilitating commercial activities remained a high priority. In the cities of New York, Baltimore, and Boston, both private and public underground sewers served as stormwater drains for streets and basements so that commerce would not be inhibited by dirty roadways or the public health endangered by "miasmas" from standing water. Municipalities with fewer resources constructed street gutters for stormwater removal that were tapped by private households wealthy enough to build connecting drains.

The cesspool/privy vault system was eventually undermined by extensive urban population growth in the first half of the nineteenth century that, coupled with transportation limitations, led to higher densities in the central core of most cities. In addition, many municipalities constructed water systems that carried unlimited and unmetered quantities of water through both piped household systems and public hydrants. Usage quickly increased as households rushed to improve their standards of living by installing appliances such as water closets. The resulting quantity of wastewater overloaded existing cesspools and saturated yards and alleys with fecally polluted water that presented a nuisance to householders and a health hazard to the public. Cities responded by planning and constructing capital-intensive sewer systems that represented a permanent departure from the haphazard, decentralized approach of the past.

During the last half of the nineteenth century, population in urban areas continued to increase; however, improved modes of transportation precipitated a decline in density as suburbs came into existence. Services to the central business district remained a top priority, and resource-poor municipalities often found themselves with no remaining funds to accommodate residential areas. In other cities, developers assumed the cost of installing services, or new homeowners petitioned the municipality for sewers, piped water, and street paving. Special

districts were created by the state to encourage municipalities to provide water and sewerage on a broader scale and were often used by suburbs who wished to avoid annexation.

Municipalities moved toward more sophisticated technology and construction materials and began to contract with consulting engineers in the design of infrastructure systems. Sometimes these advances brought unanticipated problems, especially if unregulated by state or local governments. For example, municipalities with sewer systems usually discharged their effluent into adjacent streams, believing that the stream flow would purify the waste. As a result, downstream cities suffered from pollution of their water supply until water filtration and chlorination techniques became part of municipal sewage disposal practices.

With the implementation of the New Deal, the federal government became more involved in the financing of urban infrastructure. The Public Works Administration funded 35 to 50 percent of all new sewer and water supply construction during the 1930s. In this way, the Roosevelt administration bolstered employment rates and also began to address problems of water pollution control by requiring that sewage projects include treatment. After World War II, public investment for the construction of sewer and waterworks, schools, and roads expanded from $2.9 billion in 1946 to $8.6 billion in 1950, due largely to rapid urban population growth and expanded suburbanization. The 1950 amendment to the Federal Water Pollution Control Act of 1948 further expanded federal participation by providing grants for building municipal sewage treatment facilities. Initially, access to federal money was limited due to the belief that these grants would slow the growth of municipal investments. Nevertheless, from 1957 to 1977, federal grants for highways, sewers, and mass transit increased to about 40 percent of total cost, creating a preference by local governments for new construction over maintenance of existing infrastructure.

During the 1970s, the environmental movement created a political climate that linked urban infrastructure and natural resource conservation. With the passage of environmental legislation such as the Federal Water Pollution Control Act of 1972, the federal government assumed a leadership role in environmental management by pouring money into sewer and sewage treatment projects. In 1977, federal expenditures for sewer systems accounted for 30 percent of federal aid to cities and over half of the total combined local and federal new investment. But by 1979, federal funding for infrastructure had begun to decline in response to rising inflation. As a result, many municipalities began to face chronic revenue shortfalls that have hampered their ability to fund and maintain adequate infrastructure even into the 1990s.

3.2.2 Structure of the Industry

Water and sewer systems serving urban communities in the United States are owned largely by public organizations, particularly by units of local government and even more particularly by municipal governments. Investor-owned companies still hold an important share of the water market, especially in smaller water systems, but the private sector share of sewer services in urban areas is quite limited.

Municipalities and special districts, especially those serving large metropolitan areas, account for a very large share of local government activity in providing water and sewer services. Other types of local government, including counties and townships, are important in some locations, but municipalities and special districts dominate the industry. According to data from the Census of Governments, these two categories collected 86 percent of all the revenue, made 91 percent of all the expenditures, and were liable for about 85 percent of all the long-term debt incurred by all levels of government in 1987.

Among them, the federal and state governments own and operate very few water and sewer systems. Those owned and operated by the federal government are located only at military and other special installations. In fiscal year (FY) 1987, the latest year for which data are available, local governments accounted for 97.6 percent of all direct governmental expenditures for sewerage and 99.4 percent of all direct governmental expenditures for water supplies. Over the past several decades, the federal government and state governments have granted local governments substantial subsidies for these services, especially for construction of sewage treatment systems, but there is very little federal and state ownership of the systems.

The private sector is still important for the delivery of water services; one estimate puts the percentage of urban residents served by investor-owned water companies at 15 percent. In 1986, just over 500 water systems in the United States each served at least 10,000 persons, and about 10 percent of those systems were investor-owned. An estimate of the number of investor-owned sewer systems is not readily available, but it would be small, especially for systems serving 10,000 or more persons.

3.2.3 Financing

Good financial data on these functions of government exist only since about 1957, when the U.S. Bureau of the Census began compiling and reporting financial data on local government finance. Data are available from special studies made prior to that time, but those data cannot be treated as consistent time series.

Expenditure Trends

Expenditures. Table 1 presents a compilation of the data, several characteristics of which are noteworthy. First, spending for water and sewer services has grown rapidly in nominal terms, but more importantly, spending for these services has increased substantially in real terms. After adjusting for inflation, local governments in the United States have increased their spending for sewer service by 336 percent over the 30-year period from 1957 to 1987, and by 247 percent over the 20-year period from 1967 to 1987. Over those same periods, spending for water supplies increased by 239 percent and 194 percent, respectively.

Table 1

Financial Statistics of Water Supply and Sewer Services
Owned and Operated by Local Governments (in millions)

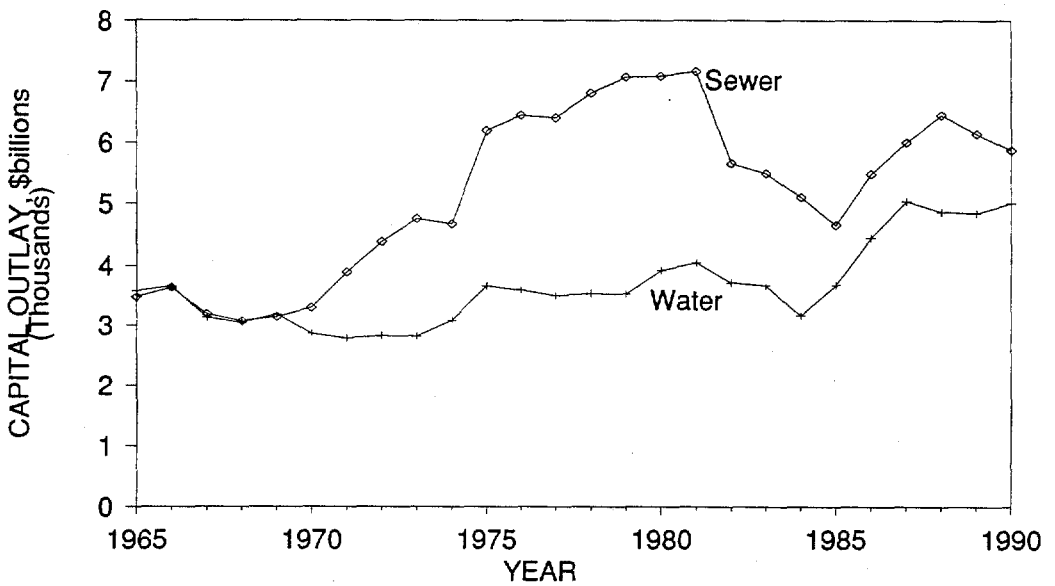
		1957	*1962*	*1967*	*1972*	*1977*	*1982*	*1987*
	Water							
(1)	Revenues	1,235	1,725	2,187	3,171	4,989	8,451	14,334
(2)	Expenditures	1,584	2,076	2,587	3,740	6,358	11,334	18,357
(3)	Capital	748	913	1,055	1,358	2,044	3,656	5,096
(4)	Operating	688	937	1,231	1,920	3,535	6,417	9,917
(5)	Interest	148	224	300	462	780	1,262	2,343
(6)	Debt	5,093	6,738	8,780	11,542	16,771	23,410	37,518
(7)	(3)/(4)	1.09	0.97	0.86	0.71	0.58	0.57	0.51
(8)	(1)/(4)	1.80	1.84	1.78	1.65	1.41	1.32	1.45
(9)	(1)/(2)	0.78	0.83	0.85	0.85	0.78	0.75	0.78
(10)	(6)/(3)	6.81	7.38	8.32	8.50	8.20	6.40	7.36
	Sewer							
(11)	Revenues	219	386	571	1,237	2,442	4,949	9,261
(12)	Expenditures	906	1,272	1,635	3,259	6,811	10,499	14,742
(13)	Capital	644	886	1,069	2,202	4,513	5,688	6,575
(14)	Operating	236	376	555	1,161	2,225	4,593	7,106
(15)	Debt	3,459	5,482	5,704	5,926	6,148	8,975	13,509
(16)	(13)/(14)	2.73	2.36	1.93	1.90	2.03	1.24	0.93
(17)	(11)/(14)	0.93	1.03	1.03	1.07	1.10	1.08	1.30
(18)	(11)/(12)	0.24	0.30	0.35	0.38	0.36	0.47	0.63
(19)	(15)/(13)	5.37	6.19	5.34	2.69	1.36	1.58	2.05

Note: Estimates of operating costs for sewer systems based on partial data from municipalities, counties, and special districts.

Source: U.S. Bureau of the Census, *Census of Governments*

A matter of special concern has been the rate of investment in capital facilities for water and sewer services. Adjusted for inflation, those rates appear in Figure 1. Water supply investments remained at a fairly constant rate from 1962 to 1982, between $3 and 4 billion per year (1982 dollars). Since 1984, however, investment rates have been increasing. Investments in sewage facilities remained at a fairly constant rate of $3 to 3.5 billion (1982 dollars) a year from 1957 to 1967. After 1967, those rates began to rise, reaching a peak of about $7.5 billion by 1980. Since then, rates of investment in sewer systems have declined to just over $6 billion in 1990.

Capital Intensiveness. A third noteworthy observation, illustrated in Figure 2, is that, despite the large investments cited in the preceding paragraph, these services have become substantially less capital intensive over the past 30 years. In 1957, local governments were spending $1.09 on water-related capital outlays for every $1.00 spent on operations. Over the next 30 years, that ratio dropped steadily to a level of $0.51 (capital/operations) spent 1987 (see row 7 of Table 1). Changes in the ratio for sewer services are even more evident. From 1957 to 1987, the ratio of capital spending to spending for operations dropped from 2.73 to 0.93 (see row 16 of Table 1).



Source: U.S. Bureau of the Census, *Census of Governments*; prices adjusted to 1982 using gross national product implicit price deflator for government purchases.

Figure 1

Rate of Capital Outlays by Local Governments in Water and Sewer Services (in 1982 dollars)

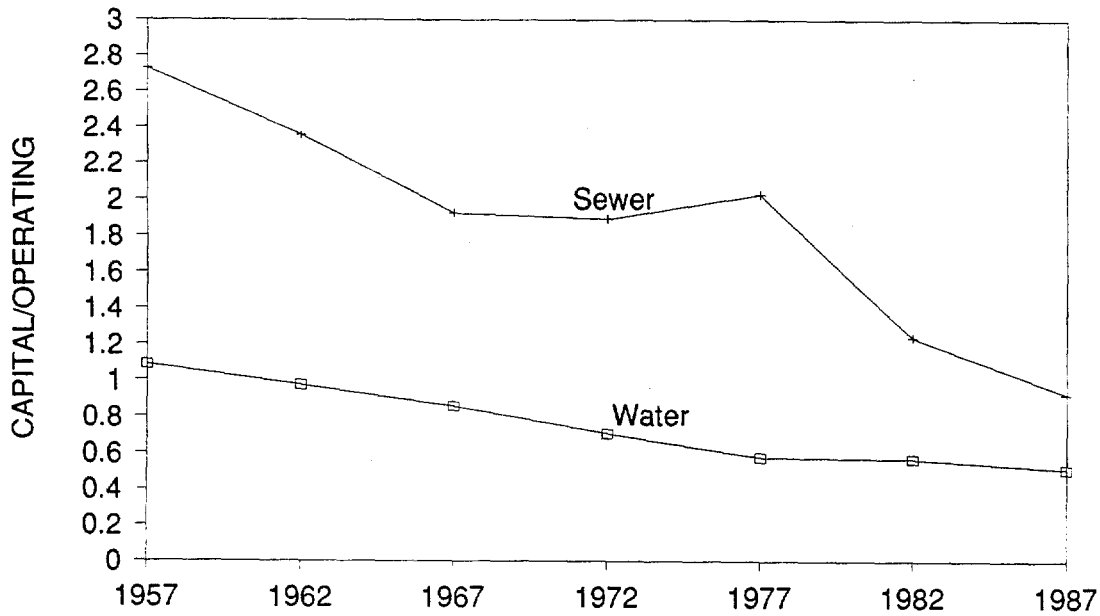


Figure 2

Ratios of Capital Outlay to Operating Expenditures for Water and Sewer Systems

These trends can be attributed to several factors. One is that per capita investment in urban infrastructure of all kinds is declining in the United States, a matter many view with alarm. Another contributing factor is the increased stringency of drinking water standards and effluent limits on wastewater treatment plants. To achieve those high levels of performance, more sophisticated plant operators are needed, as well as greater energy and chemical use. All of these factors tend to increase operating costs relative to capital outlays. Another factor that may be contributing to changes in these ratios is more efficient water use and more efficient wastewater management, which extend the useful lives and capacities of existing capital investments.

Revenues versus operating expenses. When looking at this data, a key question of interest is this: to what extent have revenues from these services been sufficient to cover expenditures? Two indicators are examined here in response to that question. Although both are simple, the process of interpreting them is less so under some circumstances. One of these indicators is the ratio of revenues to operating expenditures; the other is the ratio of revenues to total expenditures.

Figure 3 shows trends in the ratio of revenues to operating expenses for both water and sewer services (rows 7 and 16 of Table 4). That diagram shows quite vividly that, historically, local

governments have not managed sewer systems as financially self-sufficient enterprises. An important shift has occurred, however, since 1982. Before that time (from 1957 to 1982), charges collected by local governments for sewer services were either below operating costs or just above them. In 1987, however, revenues reached 130 percent of operating costs. That indicator reflects the fact that, until recently, most public wastewater collection and treatment facilities were financed by funds obtained from general obligation bonds that were repaid from general tax revenues and by intergovernmental grants from the federal and state governments. Very little came from user charges.

The ratio of revenues to operating costs is less conclusive for water supplies. Water revenues have consistently run well above operating costs, varying from a high of 180 percent in 1957 to a low of 132 percent in 1982. While it is clear that water revenues have been more than ample to cover operating costs, it is not known if they have been sufficient to cover all expenditures.

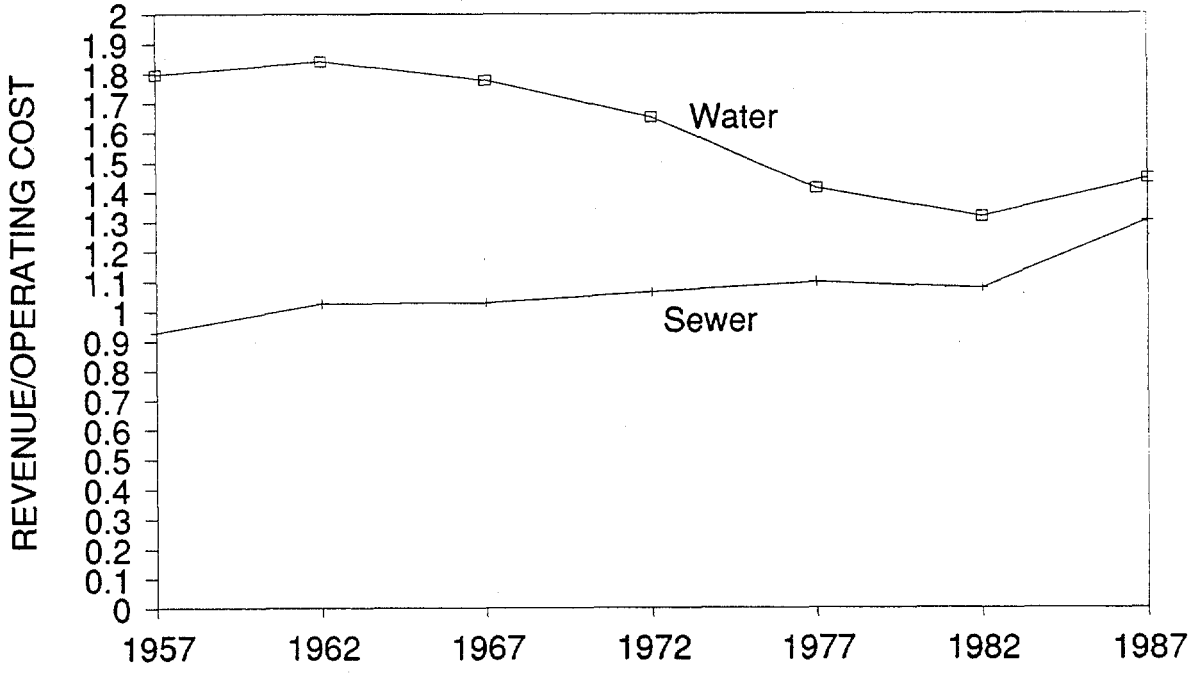
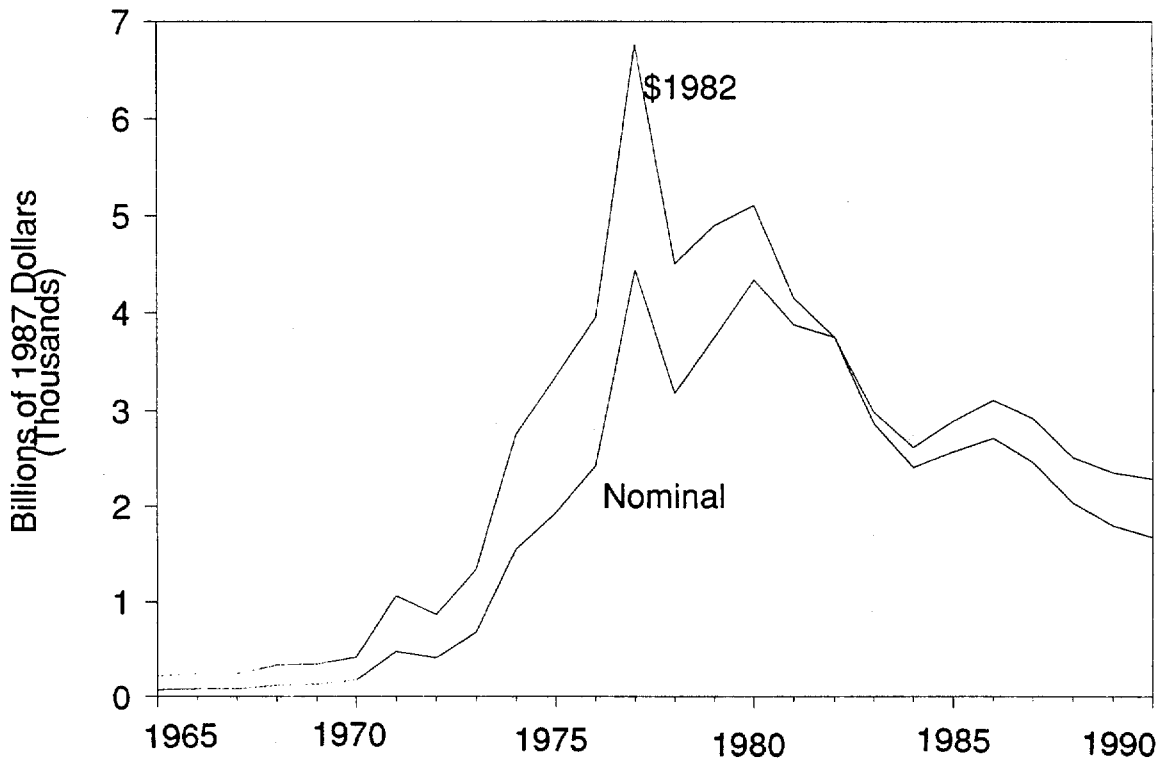


Figure 3

Ratios of Revenues to Operating Expenditures
for Water Supply and Sewer Systems

Federal subsidies. Subsidies provided by the federal government under the Clean Water Act have been especially important to local government financing of wastewater services, but these subsidies are rapidly declining. The time stream of federal funds for construction grants to state and local governments through the U.S. Environmental Protection Agency and its predecessor agencies is shown in Figure 4. (This program began at a very modest level with passage of the Federal Water Pollution Act of 1956.) The major change in federal funding occurred with the Water Pollution Control Act Amendments of 1972 (now referred to as the Clean Water Act), when funds were provided to pay for 75 percent of eligible portions of wastewater management systems. Those funds peaked in 1977, however, and in 1981 the eligibility requirements were substantially altered. Since that time, federal appropriations have been declining in real terms.



Source: *Historical Tables, Budget of the United States Government, Fiscal Year 1992;* Prices adjusted to 1982 using gross national product implicit price deflators for government purchases

Figure 4

Federal Construction Grants to State and Local Governments: Wastewater Facilities

Prior to 1972, the federal role was much less important. For FY 1957-1965, federal contributions under the grant program established in the 1957 Federal Water Pollution Control Act amounted to only 4.8 percent of local government capital outlay for sewerage. Over the period of 1966 to 1972, the federal share increased to 13.2 percent.

Tax subsidies. Before the very large federal program came into being, with passage of the Federal Water Pollution Control Act Amendments of 1972, sewer systems were receiving cross-subsidies through local tax revenues. As shown in Table 1, outstanding debt for sewerage (prior to 1972) was equivalent to 5.3 to 6.3 years of annual outlays, while revenues scarcely covered operating costs. Thus, it is clear that little of the debt was being serviced by revenues from sewer services. In 1972 and thereafter, outstanding debt for sewerage dropped to only 1.4 to 2.7 years of capital outlay, reflecting the fact that the federal grant program relieved local governments of much of the burden of financing sewerage systems. That change is dramatic when compared with similar numbers for water supply systems, where the ratio of outstanding debt to capital outlay has remained consistently in the range of 6.5 to 8.5. That range indicated a high degree of financing with borrowed capital.

To mitigate the sharp decline in direct federal grants that began in 1987, the U.S. federal government has helped states establish state revolving funds that combine both federal and state grants into a pool providing low-interest loans to local authorities. Taking the concept a step further, some states use the grant pool to guarantee additional borrowing to create an even larger pool of loan funds for sewer and waste treatment construction. For example, New York State has created an SRF approaching $3 billion—a leverage of 3 to 1 on the grant pool of about $1 billion contributed by the federal and state governments. Such SRFs provide low interest loans to communities that either would be unable to borrow on the private capital markets or would have to pay much higher interest rates.

3.2.4 Conclusion

The United States provides a case example of a totally decentralized system of water supply and wastewater treatment in which the central government role has been largely financial and regulatory, especially in the area of wastewater treatment.

During the past two decades, strategies for wastewater systems financing have shifted twice. Moving away from a dependence on local general tax revenues and bond financing (with federal subsidies built into the interest rate), a mode typical prior to the early 1970s, financing grew increasingly dependent upon direct central government grants which accounted for almost half of total system investments from 1972 until the late 1980s. After that, direct federal subsidies declined sharply, and bond financing on the private capital markets (supported by user fees) has become much more important.

Federal subsidies via the tax exemption on public bond issues remain quite important. This role has been enhanced by the development of the state revolving funds, which can leverage the remaining federal and state grant funds with the tax-exempt borrowing capacity of local authorities.

3.3 Financing Wastewater Systems in France[1]

Since 1966, the Government of France has provided local governments with an incentive system that links wastewater system financing with pollution control. The application of the "polluter pays" principle affords municipalities more choice in wastewater treatment as well as the ability to vary user charges according to amount and quality of effluent. This case study describes the statutory authority and organizational arrangements for water pollution control that provide the basis for the design and implementation of the French approach.

3.3.1 Government Agencies

France has a complex institutional structure in the sector with three main actors: municipal governments (communes) that own and operate water supply and wastewater systems; private contractors that operate WS&S systems for a large percentage of the communes under contract; and regional river basin authorities that oversee exploitation of water resources, control discharges into water courses, and levy a system of fees and charges on wastewater dischargers.

Responsibility for providing public wastewater collection and treatment services rests primarily with local government, whose basic unit is the commune. There are approximately 38,000 communes in France, varying in size from small villages to large cities. Except for Paris, each commune is governed by an elected council, which elects one of its members to serve as mayor.

Communes work within the constitutional and statutory authority of the national government. The national authority is administered through more than 90 metropolitan departments covering designated geographic regions of the country; each department is administered by a prefect appointed by the national government. Each commune located within the geographic boundaries of a given department is subject to the authority of that department. Commune mayors in each department elect from among themselves a General Council, a body that both advises the prefect and allocates funds.

Several national ministries, including the Ministries of the Environment, Industry, Agriculture, and Health play significant roles in managing water quality. Each of these ministries reports to the prime minister, and each also has regional units that operate through the departments.

In 1966, France created six "financial basin agencies" which, although they are government agencies, enjoy a high degree of autonomy to establish and administer charges on water withdrawals and effluent discharges. They have broad planning discretion for water supply and water quality management and can effectuate those plans through a system of charges. They

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[1] This case study is based primarily on information from (1) OECD, *Economic Instruments for Environmental Protection*. Paris: 1989, and (2) Remi Barre and Blair T. Bower, "Principles, Organization, and Functioning of the Water Management System in France", in Blair T. Bower, et.al. *Incentives in Water Quality Management—France and the Ruhur Area*, Washington, D.C.: Resources for the Future, Inc., 1981.

do not deliver water and sewer services, however, and operate within effluent standards and water quality criteria established by others.

3.3.2 Laws

France's WS&S agencies operate under authorities established by several basic laws, among the more important of which are the Civil Code and Rural Code; the Code of Public Health and Departmental Regulations; the Classified Establishments Law; and the Law on Water.

The Civil and Rural Codes define water-related rights and duties of landowners and empower administrative authorities to enforce these codes. Among its many provisions, the Code of Public Health establishes protection of drinking water intakes, and establishes "normal" conditions for wastewater discharged to sewers.

The Classified Establishments Law is the most basic law for controlling nuisances, including noise, air, and water pollution and hazards. Its specific procedures control some 400 types of pollutant generating activities called *Classified Establishments*. Those activities fall into one of two categories: Category D establishments are those that simply have to declare to the prefect and the Classified Establishment Service their intention to begin operations; Category A establishments, on the other hand, require a permit before operations can begin. In 1980, there about 500,000 establishments in Category D, and about 50,000 in Category A.

An administrative agency associated with the Ministry of Environment, the Classified Establishment Service, is charged with several responsibilities under the establishments law. It states policies for new and existing plants in Category A; it periodically reviews and updates nomenclature for all classified establishments; and it defines "normal" conditions for operation and discharge of effluents.

The Law on Water of 1964 is the most comprehensive of the French water laws, setting forth the general framework for national water policy: drinking water supply and public health, pollution control, agricultural water use, industrial water use,[2] water-based transportation, biological life in waters, recreation, and flow conservation. The law covers all types of dischargers and all kinds of water, including surface water, groundwater, and sea water. These are among its most important provisions:

- Mandating a National Ambient Water Quality Inventory, a monitoring program to determine national water quality
- Regulating the sale and use of certain products and materials that may cause water pollution

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[2] Industries must provide for their own wastewater disposal, either by discharging to public systems or directly to streams.

- Mandating the establishment of an Ambient Water Quality Objectives Policy to define
  - use-based water quality criteria
  - predominant uses for each section of each river within a department
  - effluent standards
- Establishing regulations on wastewater dischargers, including requirements for sampling
- Creating the basin agencies and their administrative boards, and giving those agencies authority to establish, levy, and collect charges on water withdrawals and effluents from waste treatment plants

3.3.3 Private Sector Role in Managing WS&S Systems

In France, which has probably the most developed system of private contracting for WS&S management in the world, 60 percent of the total population is served by privately operated water systems. The three general types of contracting arrangements between French municipalities and private management firms are:

- Concession contract, in which the private firm builds and operates WS&S facilities. The firm is compensated by fees collected directly from the WS&S consumers, as stipulated in the contract between the municipality and the private firm.
- Farm lease, in which the municipality builds the WS&S facilities with the firm managing the facilities and collecting fees. The firm, however, keeps only a portion of the fees collected to cover its management costs, the remainder is paid to the municipality to cover capital investment costs.
- Management contract, in which the municipality retains control of the facilities and contracts out only certain parts of the management operation. Each management contract would specify exactly what services are to be provided and how the private firm is to be compensated.

In France, most municipal governments retain ownership of the WS&S assets, with the private contractor operating under a long-term contract. Given their extensive experience within the country, French water management companies have grown quite large. They are now exporting their expertise to other industrialized countries, such as the United States, and increasingly to developing countries as well. The French are well established in the Cote d'Ivoire and are leading contenders for the Buenos Aires contract. (The recently privatized British water authorities are now following suit and aggressively beginning to seek opportunities abroad.)

The French experience with private sector management of WS&S systems is instructive for developing countries. Since these companies operate on long-term contracts with negotiated pricing factors and profit margins, they are noted for managerial efficiency.

3.3.4 Financing

Under the authority of French law, there are several sources of revenues to cover O&M costs and capital outlays for wastewater treatment plants:

- Sewage tax
- Premiums and superpremiums paid by the basin financing agencies
- Grants from the basin financing agency and general council of the department
- Subsidized loans from a special bank, the Caisse des Depots et Consignations, operated by the national government.

The sewage tax is levied on all water users by a municipality (commune) according to a declining rate structure. Although termed a "tax," it is really a user charge, as it is based on the amount of water consumed. If the quality of the effluent from a commercial customer is substantially different from that of a household, a surcharge may be applied to reflect the strength of the waste.

Revenues from extraction and effluent charges levied by the basin financing agencies are used to pay premiums and superpremiums to operators of waste treatment plants. Effluent charges for municipalities are calculated as the product of four factors the number of inhabitant equivalents discharging into the municipal system; a city size coefficient to account for the increase in average load per inhabitant as size increases; a zone coefficient that reflects the location of the municipality within a basin; and a base load charge in units of francs per inhabitant equivalent.

Funds flow back to municipalities from the basin financing agencies in the form of premiums, superpremiums, and grants. Each premium and superpremium is calculated by a complex formula based on total suspended solids and oxidizable material removed from the waste stream (for premiums) and on the amount of pollutant removed and on plant performance (for superpremiums). Industries also may receive superpremiums, but only municipalities are eligible to receive premiums.

Although not restricted to that purpose, premiums and superpremiums are usually applied to operating costs—but they rarely cover more than half these costs. Such funds usually amount to about 10 to 15 percent of revenues generated from the sewage tax. Capital costs are financed by grants from basin agencies (15 to 50 percent of capital costs), subsidized loans from the bank (about 30 percent of costs), and any sewage tax revenues that may be left after paying for operating costs. Subsidized loans are made by the Caisse des Depots et Consignations, a public institution with access to funds from the national savings account system. It makes loans to municipalities and general councils at interest rates well below those in the private market. Project eligibility for funding from all these sources varies from basin to basin, and the percentage of funding from each source depends on project type, beneficiaries, and location; often, projects must compete for available funds. If the sources just described are

insufficient, as they usually are, a good portion of the debt service is covered from the general budget.

3.3.5 Conclusions

France is a notable example, employing both the European River Basin Authority structure and an extensive private-sector involvement in local WS&S system operation. The river basin structure allows planning and financing of systems on a regional watershed basis and permits collection of effluent charges from wastewater dischargers, both municipal and from private industry. The involvement of private water management companies combines the managerial efficiency of the private sector with local governmental ownership of their WS&S assets.

It should be noted that, even with the system of effluent fees and relatively high user charges at the municipal level, capital costs are still highly subsidized by the central government though a system of grants.

3.4 Financing Wastewater Systems in Korea

During the 1980s, the Government of Korea—following the pattern of many developing countries—invested in urban water systems because of rising demand but neglected sanitation until widespread pollution had occurred. In response to this crisis and in light of urban residents' increased ability to pay, the government has since developed forward-looking policies designed to protect and encourage more efficient use of limited water resources. The policy decision to initiate a program of gradual and technically supported decentralization of wastewater management to local governments is precipitating new ways of thinking, in both public and private sectors, about the delivery and financing of wastewater services.

3.4.1 Background

During the late 1970s and 1980s, rapidly rising incomes precipitated a corresponding demand in Korea for piped water, sewage disposal, and other urban services. In spite of extremely high population densities and increasing urbanization, the government succeeded in expanding the quality and level of certain services. Currently, about 90 percent of city populations enjoy piped water and close to total coverage is expected by the year 2001.

The provision of urban water services has taken a toll, however, on Korea's limited water supply. Although a system of dams and reservoirs has been developed over the past 30 years to regulate year round water flows in the major rivers, few suitable water sites remain. In addition, a 1982-86 study of water quality in the six major river basins revealed pollution in the rivers and their tributaries.

To address growing water quality concerns, the Ministry of Construction began in 1987 to develop a National Water Improvement Program (NWIP), which was approved by the Korean

government in September 1989. The program's two major goals are to upgrade municipal water supplies and improve water quality in rivers and coastal waters. The National Wastewater Treatment Plan (NWTP), scheduled to be completed by 1996, is the action plan for pursuing the latter goal. Strategies include relocating certain industries from water supply catchment areas, constructing wastewater treatment plants for industry and livestock farms, and constructing sewage treatment plants (STPs) in 64 municipalities to serve 65 percent of the population by 1996. Government financial support to municipalities is based on their ability to provide own-source financing and varies from 60 to 80 percent of construction costs for interceptors and treatment plants. Cities with populations greater than one million, designated "special cities," are expected to finance 100 percent of their investment.

3.4.2 Sector Institutions and Environmental Legislation

Institutions

In Korea, the Ministry of Environment (MOE) and the Ministry of Construction (MOC) are the most important governmental institutions providing wastewater management. The MOE is responsible for the planning, construction, and operation of municipal and industrial wastewater treatment plants and other water pollution control activities. The MOC's major role is in water resources management, including construction and operation of dams. In addition, this ministry provides design guidelines for municipal sewer systems and coordinates system construction and operation.

Within the subsector, municipalities are required to develop their own sewerage master plans that contain a description of the existing sewer system and the current condition of both combined drainage and sewer systems. Sewerage master plans also assess the pollution level in receiving waters, identify potential locations for wastewater treatment plants, and recommend strategies for system expansion. The Ministry of Home Affairs (MOHA) acts as a consulting body to municipalities and consolidates statistical information. The Economic Planning Board and the Ministry of Finance allocate financial resources and foreign loans to the various agencies. The Environmental Preservation Committee functions as a coordinating mechanism for all agencies involved in water pollution control efforts; however, the committee has played little role thus far in setting policies and standards for environmental protection.

Environmental Legislation

In its Sixth Five-Year Economic and Social Development Plan (1986-91), the Korean government formally recognized that public demand for adequate services and a clean environment had increased. Accordingly, the government endorsed an Environmental Policy Basic Law, in 1990, supplemented by regulations and standards for air, noise and vibrations, water quality, hazardous chemicals, and settlement of environmental disputes. Municipalities, as well as individuals, now face heavy penalties, including imprisonment, for failure to comply.

In addition, the MOE requests that cities prepare an environmental impact assessment for proposed investments to reduce negative environmental impacts during construction and operation of sewage treatment plants. Other requirements include a sanitary greenbelt around

STPs, facilities to prevent excessive odor and noise, and the study of models for employing digested sludge in agriculture.

Box 2

Willingness to Pay for Clean Water in Seoul

Because of water pollution, the city of Seoul was forced to abandon two water supply intakes and divert more water from an upstream reservoir. Water pollution has also increased the costs of drinking water treatment. A 1983 study found that chemical and labor costs (the relevant variables) were 7.286 won/m^3 higher for Bokwangdong purification plant inside the city than for the Paldang plant just upstream from Seoul. With a capacity of 300,000 m^3/day, this cost amounts to 2,185,800 won/day (US$3,279/day) for just one of Seoul's nine water purification plants. Water companies are frequently fined by the Ministry of Health and/or ordered to suspend business for certain periods. There is also the risk of groundwater depletion.

Fortunately, in planning for the 1988 Olympics, the government saw fit to improve the quality and appearance of the Han River. A sewage pipe system and three new sewage treatment plants were built. River water quality improved markedly. At the Bokwangdong intake station, biochemical oxygen demand (BOD) levels fell from 7 to 3 mg/l between 1984 and 1986, which probably helped reduce some of the above-mentioned treatment costs.

Still, city drinking water has a very bad reputation in Seoul. Although the government insists it is safe to drink, a 1987 survey of residents showed that 78.7 percent believe its sanitary condition is "bad." Large proportions also reported "uncomfortable experiences" due to rust, odor, sediment, or a combination of these. Only about 6 percent dare to drink the tapwater without boiling it. Higher income families use water purification devices or buy bottled water. Although Korean law prohibits the sale of bottled water to Korean nationals, a black market for residents has developed; the price is thousands of times higher than that of city water (184,210 won/ton vs. 60 won/ton). For lower income people, city water costs include the energy needed to boil the water, which kills bacteria but has no effect on other harmful substances.

Consumers having to pay the costs of water pollution violates the "polluter pays principle;" unfortunately, however, polluters are not "willing" to pay, but must be forced. Since mid-1983, the Seoul Pollution Control Service Corporation has been collecting fees from industries that violate water pollution standards, and the money is in turn loaned to industries for acquisition or improvement of pollution control equipment.

Source: Shin 1991

3.4.3 Sector Financing

The financing of sector investments is usually accomplished through a combination of bonds, loans, tariffs, city and developers' contributions, and central government grants. The Korean government collects the major taxes for most municipalities, which the Ministry of Home Affairs then redistributes in the form of "share tax revenues." The size of each municipality's grant is based on a complex analysis of its financial resources. Land developers' contributions currently amount to approximately 70 percent of the cost of laterals, mainly in newly developed areas.

Historically, sewage facilities have been financed by compulsory, low interest municipal bonds that mature in only five years, resulting in high levels of subsidization by the Korean government to prevent excessive burdens on city revenues. In recent years, the MOHA's Water and Sewerage Fund has provided an additional source of financing for sanitation through the issuance of bonds in each province, although the fund's resources are limited to approximately $200 million.

Water tariffs cover the full cost of O&M and depreciation and provide return rates of between 4 percent and 10 percent on fixed assets. Supplemented by foreign and local loans, these revenues have allowed the sector to satisfy increasing water demand so that only a few cities now have water shortages. Sewerage tariffs, introduced in the largest cities in 1984 and monitored by the MOHA, have been used by municipalities to recover O&M expenses, including depreciation, and interest on loans. By 1987, sewerage tariffs were being used in over 52 cities but averaged only 30 to 40 percent of water tariffs. The MOC has provided guidelines for cities to use in setting new sewerage tariffs after January 1, 1992, as part of a program of gradual decentralization of certain urban services; these tariffs are expected to generate a large enough rate of return to also finance a portion of capital expenditure. During this transition period of 1 to 3 years, the MOC will continue to review and approve the municipalities' proposed tariffs.

3.4.4 Sanitation and Sewer Services

All premises in Korea use either traditional toilets, with excreta holding tanks, or flush toilets that drain into sanitary sewers or combined stormwater drains/sewers. The law requires that septic tanks be used to separate solid waste from the contents of flush toilets not connected to sanitary sewers. Municipalities or private contractors then collect the solid contents from traditional toilets (nightsoil) and septic tanks (sludge), pretreat it in nightsoil treatment plants, and discharge it into rivers.

In 1985, 46 percent of municipal populations still used traditional toilets with nightsoil collection and treatment. By 1989, however, the percentage of city residents with flush toilets had risen (from the previous 54 percent) to 61 percent, and this share is expected to increase to at least 80 percent by the year 2001. All new premises are required to have flush toilets with septic tanks. Residential/commercial buildings larger than 1600 square meters must construct and maintain their own wastewater treatment facilities.

Approximately 75 percent of Korea's urban population is currently served by combined drainage systems that carry both stormwater and wastewater to nearby rivers. Although the government recognizes that separate systems conveying stormwater to streams and wastewater to treatment plants via sanitary sewers would reduce risks to both public health and the environment, total and rapid conversion in urban areas would likely be prohibitively expensive and disruptive during construction. Therefore, a step-by-step conversion is planned, instead, that includes construction of interceptors along the rivers to collect flows from combined drains. These interceptors will separate the two streams and direct raw sewage to treatment plants and overflow stormwater directly into rivers.

3.4.5 The Pusan and Taejon Sewerage Projects

As part of its NWTP implementation strategy, the Korean government is seeking funding for a project to construct or expand sewage treatment facilities in two of Korea's largest cities, Pusan and Taejon. Both cities are important cultural and commercial centers committed to improving their sewer services and local environment. Given their high growth rates in recent decades, Pusan and Taejon anticipate populations of 4.8 million and 1.65 million, respectively, by the year 2001.

Municipal services in Pusan and Taejon are provided by the city governments, with government bureaus responsible for planning and budgeting of their respective activities but facility operation, maintenance, and construction generally decentralized to city districts. Water supply services in Pusan and Taejon are managed by self-financing municipal corporations. A sewerage division in each city, under the Bureau of Construction, provides sewer services consisting mainly of combined storm/sewer drains in the form of open channels along roads and buried conduits.

In Pusan, 95 percent of the population have access to sewer service and approximately 67 percent of the population use flush toilets; the remaining 1.3 million use traditional toilets storing nightsoil in vaults. The Taejon system serves about 73 percent of the population, with 46 percent using flush toilets and 0.58 million using traditional toilets. Both cities plan to provide sewer services to all residents within 10 years, including full secondary treatment of all wastewater generated, by phasing out separate nightsoil treatment, increasing wastewater treatment capacity, and expanding the municipal sewer systems.

The two cities' revenues and expenditures are divided between General Accounts and Special Accounts. Special Accounts are used for revenue generating activities related to water, sewerage, and housing, and are expected to be financially autonomous. In recent years, both Pusan and Taejon have generated cash surpluses on their General Accounts and, in aggregate, on their Special Accounts. Combined bills for water, sewage, solid waste, gas (in Pusan only), electricity, and television are prepared by the Integrated Billing Section of each district. Maintenance of the computerized billing and accounts receivable system is contracted out to private computing firms, which provide summary reports to the districts and utility companies. Bills are paid at banks and are due within one month of the billing date, with

interest penalties charged on overdue accounts. If the combined bill is not paid within two months, utility service providers are notified.

The Pusan and Taejon Sewerage Project, to be implemented over a five-year period, has an total estimated cost of US$272.1 million. Specific project areas are construction of the first phase of the Yongho sewage treatment plant (a sewage pumping station) and 11.4 km of interceptors in Pusan, and construction of the second phase of the Wonchon Dong treatment plant and 11.9 km of interceptors in Taejon. Both cities would receive technical assistance in updating the sewer master plans and supervising construction of the treatment plants.

Project financing is expected to come from a combination of sources. The Korean government would use international donor funds to provide the two city governments with low interest loans for financing the cost of materials and equipment (about 15 percent, or US$40 million). The foreign exchange and interest risks on the loan would be borne by Pusan and Taejon. Local lending institutions would finance the remaining civil works and technical assistance costs: US$40.3 from the Regional Development Fund, capital contributions of US$64.4 million from the cities' General Accounts, US$122.1 million from internal cash generation, and US$5.3 million as a one time central government transfer.

Based on financial projections for 1991-98, the project would constitute about 28 percent of Pusan's estimated capital spending for sewer services between 1990 and 1998, requiring a 15 percent increase in sewage tariffs in January 1992 and average annual increases of 7 percent. Because the newly elected 1992 City Council was to assume responsibility for setting tariff fees on the date of the proposed increase, Pusan expected to introduce the higher charges by January 1993 and meet any interim revenue shortfall from the existing surplus in the General Account. The new tariffs were to be calculated to yield sufficient revenues to cover O&M costs (including depreciation) and debt service payments and also to provide an annual return of at least 5 percent on net fixed assets. Taejon was to use the same strategy, instituting a 56 percent tariff increase by January 1993 to meet O&M costs and to support a 3-percent rate of return. In addition, the Taejon city government expects to finance about 32 percent of its 1990-98 spending from internally generated funds, thus reducing the burden on its General Account.

3.4.6 Conclusions

The Korean government's current use of alternative strategies for financing wastewater investments is indicative of a growing realization that past practices are inadequate either to close the current gap between water supply and wastewater coverage or to meet future demand for wastewater services. The decision to mobilize resources at all government levels and, to a lesser degree, within the private sector has resulted in policies designed to promote both economic efficiency and equity in consumption and delivery of wastewater services:

- User tariffs, based on urban consumers' increased willingness and ability to pay, that can finance not only O&M but also a portion of capital expenditure

- A legislative mechanism for enforcing water pollution control
- Financial incentives for municipalities to seek their own sources of financing for construction of interceptors and sewage treatment plants
- Low interest loans (replacing central government grants) for construction of municipal wastewater facilities.

These policy and planning initiatives are supported by mechanisms that act as a type of "means testing" for allocating scarce financial resources. Because the largest Korean cities enjoy economies of scale in the collection and treatment of wastewater, as well as a larger income stream, new financing policies have made them ineligible for central government subsidization of capital investment. Similarly, new premises that exceed 1600 square meters must construct and maintain their own wastewater treatment facilities, and established industries are expected to assume financial responsibility for the level and amount of effluent discharged into water sources. Because these incentives are likely to encourage the use of local capital, and possibly an expansion of privatization in certain areas, those cities with less ability to finance needed investments should benefit from reduced competition for financial and technical assistance from the central government. While this outcome serves to increase both equity and efficiency, it is also likely that the 35 percent of the population not included in the current expansion of service delivery will be those who cannot afford to pay the true cost of services. To reach this group, more innovative financing mechanisms will need to be developed.

Currently, long-term financing instruments that match the typical cost recovery span in the sector do not exist in Korea; however, there is a strong case against continued use of inadequate and inappropriate financing methods. Continued subsidization of treatment plant construction through grant financing may result in overdesign of facilities and wasteful investments as municipalities implement more extensive water and sanitation projects. It is estimated that increasing income and savings levels in Korea could finance at least 15 to 25 percent of investment needs through bonds, although cities would need to pay higher interest rates to attract such funds than those paid on less risky, short-term investments.

In the past, a chronic problem has been a lack of communication and information transfer among Korean institutions responsible for wastewater management. The strengthening of coordinating agencies such as the Environmental Preservation Committee would ensure that successful programs are replicated rather than reinvented. For example, a Government Management Fund already exists for financing development in rural areas; this could serve as a model for a similar funding mechanism for municipalities.

4

LESSONS LEARNED

The three case studies, as well as the background information on WS&S sector finance, reveal a number of important lessons learned.

1. *In no case have direct user charges been sufficient to finance wastewater collection and treatment.*

Few local authorities have even attempted to impose direct user fees at a high enough level to fund all operating and capital costs. Generally, these authorities have relied on a combination of national subsidies and local general revenues to fund the capital costs. In many cases, even O&M costs have been partly covered by such support. The proposed tariff increases in Korea's case will be instructive as to the success of substantially raising tariffs to cover new sewerage investments. That country has an advantage in that household incomes there have risen dramatically over the past decade. It also has a municipal billing system that links sewerage charges to both water service and electricity, so there is a high incentive to pay.

2. *If not carefully designed, national subsidy programs can distort local investment decisions.*

The U.S. federal government provided extensive construction grants to local authorities for treatment plant construction without additional incentives to maintain municipal investment in the sector. As a consequence, local governments decreased their own contribution to the wastewater sector as the federal government share rose. In Korea, prior to adoption of the revised sector policies in the late 1980s, lack of long-term financing mechanisms for local sewer systems forced local governments to rely on short-term bond financing and national subsidies. In the United States, the general system of subsidizing municipal infrastructure investment through tax-exempt bonds has several additional problems. In terms of equity objectives, such subsidies are almost impossible to target to poor beneficiaries. Furthermore, poorer jurisdictions tend to pay higher interest rates on their bonds, since these areas are viewed as less credit worthy. The construction grants program created in the Unites States during the 1970s was open-ended in that it paid a flat percentage of all eligible costs. This meant that the impact on the federal budget was also open-ended. The tax exemption on local government bonds in the United States is similarly open-ended and also is largely "hidden," since such tax exemptions never appear in the federal government budget.

In general, open-ended facility construction grants provide incentives to overinvest in expensive facilities rather than to achieve the most cost effective solutions to service provision. Low interest loans for facility construction also provide the same perverse incentives. In

addition, such subsidized credit schemes tend to undermine the development of financial markets within a country. In developing countries, such subsidized credit schemes often have the additional problem of being run on a less than business like basis, with repayment not taken seriously. This practice not only undermines the credit institutions but also gives local governments disincentives to manage their finances responsibly.

3. *Wastewater services are expensive, and the need for them is accelerating in developing countries due to current water supply investments.*

Wastewater collection and treatment is expensive, particularly for retrofitting densely populated urban areas. However, few system users are aware of the true costs of service provision, since much of that cost is subsidized and not billed to users. Indeed, most users in both industrialized and developing nations would be surprised to learn that wastewater collection and treatment costs are about 150 percent of piped water supply unit costs. The current high levels of piped water investment in developing countries and the gap between water supply and wastewater system coverage guarantees the future investments in the WS&S sector will be increasingly devoted to wastewater systems. This has been the case in the United States and other Western nations, and holds true today in Korea and in most of Latin America.

4. *Economic incentives and regulation can be used to promote water conservation and encourage waste dischargers to reduce the volume and toxicity of effluents.*

In France, effluent charges have proven effective in changing the behavior of polluting industries, especially when combined with rebates for industrial treatment investments and tight regulation over discharges. The fact that effluent charges are used specifically to finance pollution abatement investments at the river basin level makes them more politically acceptable locally. Direct user charges are important both to provide conservation incentives and to raise revenues. For this reason, it is desirable to combine water and sewer charges on the same bill so that the linkage between the two is clear. It is also important that user charges remain buoyant rather than fixed over time; charges need to be adjusted regularly to at least keep up with inflation. As the case in Korea shows, sewer charges are often set artificially low, and a schedule of periodic raises that exceed the rate of inflation will allow the rates to approach more reasonable levels.

5. *Although effective demand for wastewater services is fairly low in many countries, it can be influenced by both regulation and public education.*

In all three case studies, the national government has played an important role in mandating pollution abatement for localities. In addition, public education has heightened awareness of water pollution issues and increased demand for clean water. Given the current low demand for wastewater cleanup in most developing countries, such regulation and education will also be necessary to stimulate local demand on the part of both sewerage users and local government officials. Municipal demand is needed because wastewater systems cannot be financed without local general revenues.

6. *Private sector participation is likely to bring management efficiency and lower operating costs to sector delivery institutions and may bring additional capital financing, as well.*

The private sector can play an increasing role in WS&S institutions as these institutions move toward fuller cost recovery. The advantage of such participation is the lower operating costs possible through improved employee productivity, better demand management, collection efficiency, and better use of equipment and capital assets. There is considerable interest in the use of privatization to generate additional capital investment in the sector; private capital is generally more expensive than public funds, however, and the riskier the investment, the higher the return demanded by private investors. As yet, there has been little experience with WS&S private investment in developing countries, and it is unlikely that much private capital will be available in the near term. There are, however, some interesting examples now underway from which valuable lessons can be learned.

7. *Poor financial performance by local WS&S delivery agencies and national financial institutions is jeopardizing investment capital for the WS&S sector.*

Throughout the late 1980s, the level of investment in the WS&S sector remained high and in the early 1990s, accounts for an increasing share of all public investment in developing countries. Much of this investment has taken the form of loans to local water supply agencies, with repayment funds expected to come from user charges. Financial performance of these local delivery agencies has not been good, however, and it is clear that debt repayment will not be forthcoming from a large number of these borrowers. For their part, central government lending agencies have also not performed well. For example, a number of infrastructure loan funds have been decapitalized; few of these organizations have developed into financial intermediaries. If such institutions do not begin to function better, continued lending from external donor agencies may be at risk. Such support has amounted to about one third of the total WS&S sector investment over the last decade and plays an important role in stimulating sector management reforms.

8. *The organization of WS&S institutions has important implications for financing arrangements.*

It is clear that water supply and wastewater services must be functionally and administratively linked. In the United States and Europe, for example, single institutions typically manage both services. At a minimum, this facilitates investment decisions and billing systems. In Korea, although the two services are managed by different agencies (water supply by a separate authority and sewerage by a municipal department), the billing is combined. There also needs to be some linkage to local government, since local public funds are almost always required to finance part of the wastewater system. Indeed, if developing countries move away from subsidized credit systems for local infrastructure investment, access to local tax revenues for loan backing should become more important. The French case study shows, also, how

intermediate-level agencies (the river basin authorities) can be used to provide regulation and administer the system of effluent charges.

9. *The self-financing mandate makes it harder to guarantee the poor access to WS&S services.*

Increased reliance on user fees (both consumption-based charges and connection/availability fees) places the poor at risk. Since it is difficult to link rates directly to individual ability to pay, local authorities in developing countries have historically tried to keep WS&S rates low for all users and have incorporated cross-subsidization into the rate structure. Pressure to recover more costs through direct user charges has led delivery agencies to target higher income groups who can better afford higher rates. Although national subsidy schemes within the sector are often justified on redistributional grounds, they seldom include any specific provision for targeting the poor. Korea is attempting to address this problem to a degree by providing a sliding scale of subsidization depending on local authorities' ability to provide own-source financing. Use of property tax surcharges to finance part of the investment cost is generally redistributive, in that property value is associated with wealth. This works, of course, only if the property tax is managed well.

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THE WASH PROJECT

With the launching of the United Nations International Drinking Water Supply and Sanitation Decade in 1979, the United States Agency for International Development (A.I.D.) decided to augment and streamline its technical assistance capability in water and sanitation and, in 1980, funded the Water and Sanitation for Health Project (WASH). The funding mechanism was a multi-year, multi-million dollar contract, secured through competitive bidding. The first WASH contract was awarded to a consortium of organizations headed by Camp Dresser & McKee International Inc. (CDM), an international consulting firm specializing in environmental engineering services. Through two other bid proceedings since then, CDM has continued as the prime contractor.

Working under the close direction of A.I.D.'s Bureau for Science and Technology, Office of Health, the WASH Project provides technical assistance to A.I.D. missions or bureaus, other U.S. agencies (such as the Peace Corps), host governments, and non-governmental organizations to provide a wide range of technical assistance that includes the design, implementation, and evaluation of water and sanitation projects, to troubleshoot on-going projects, and to assist in disaster relief operations. WASH technical assistance is multi-disciplinary, drawing on experts in public health, training, financing, epidemiology, anthropology, management, engineering, community organization, environmental protection, and other subspecialties.

The WASH Information Center serves as a clearinghouse in water and sanitation, providing networking on guinea worm disease, rainwater harvesting, and peri-urban issues as well as technical information backstopping for most WASH assignments.

The WASH Project issues about thirty or forty reports a year. WASH *Field Reports* relate to specific assignments in specific countries; they articulate the findings of the consultancy. The more widely applicable *Technical Reports* consist of guidelines or "how-to" manuals on topics such as pump selection, detailed training workshop designs, and state-of-the-art information on finance, community organization, and many other topics of vital interest to the water and sanitation sector. In addition, WASH occasionally publishes special reports to synthesize the lessons it has learned from its wide field experience.

For more information about the WASH Project or to request a WASH report, contact the WASH Operations Center at the above address.